REMARKS

In the Action dated December 14, 2007, the Examiner indicated that claims 38, 39-41 and 43 are allowed, and that claims 20, 22, 26, 27, 29, 30, 33 and 37 are objected to as being dependent on a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant notes with appreciation the allowance and indication of allowability of these claims, and reserves the right to amend the claims objected to place them in allowable form.

In the Action, the Examiner also rejected claims 16-19, 21, 24, 25, 28, 31, 32, 35, 36, 40, and 46-71, as being unpatentable over Glenn et al. in view of Lambersten et al. Applicant respectfully believes that the Examiner's rejections are not justified for the reasons below. Applicant also encloses a Declaration Under 37 C.F.R. § 1.132 of John Brooks, an independent expert, to support Applicant's position that the Examiner's obviousness rejections are not justified and should be withdrawn. Applicant was assisted in the preparation of this response by attorney Robert M. Isackson (Registration No. 31,110).

1. <u>Glenn</u>

Glenn et al has invented an apparatus for a multistage boosting of the product purity in order to achieve 95% oxygen purity for breathing and below 9% of oxygen in the fuel tank inerting product. Glenn expressly teaches in column 6 – lines 39-41 the following: "The product gas from the inert gas generator 14 should be **<u>9% or less oxygen to be suitable</u>** for use for inerting fuel tanks". Applicant respectfully submits that Glenn does not teach or suggest the subject matter of Applicant's claims rejected by the Examiner.

Arguments

1.1 All Applicant's claims describe either a method or a system that operate to produce an oxygen-deplete gas mixture having an oxygen content that is above the "9% or less" range taught by Glenn. Significantly, for all the years following Glenn, and until only after I disclosed my invention of using hypoxic air having oxygen of 10% or 12% to 16% to the Federal Aviation Authority and Boeing representatives at an industry meeting in 2001, no one in industry or in publications disclosed or suggested that hypoxic air, made by air separation of an air flow, could have an oxygen content above 9% and be safely used to inert a fuel tank. See Mr. Brook's Declaration at paragraph 14. Further, to my knowledge, the system disclosed in Glenn was never commercialized be the multiple air separation construction is too heavy and inefficient for commercial aircraft, and did not meet the safety requirements for military aircraft.

1.2 Once Applicant discovered Hypoxic Fire Prevention phenomena (described in Applicant's earlier patent applications from which this application claims priority) and subsequently informed FAA and Boeing of this discovery 2001, the FAA and Boeing conducted duplicative research and have announced that they will now build systems maintaining 12% of oxygen in the fuel tanks (see attached article from USA Today of February 17th 2004 and Mr. Brook's Declaration at paragraph 14). In the USA Today article it clearly says: "***The FAA tests showed that a fuel tank would not explode if oxygen levels were at 12%. That small difference allowed engineers to design much smaller nitrogen gas systems, substantially lowering the cost and weight of the devices.***" I believe that they take credit of my discovery and invention.

1.3 Glenn et al describes a very complicated system for enriching nitrogen product via multiple stages that creates a totally different composition of the product than hypoxic air produced by a partial extraction of oxygen. At the end of this document I attach a table that shows how different a final product would be if, for instance, we would like to achieve 15% oxygen, which is also in the range claimed by Applicant in the independent claims under rejection. The table demonstrates that Nitrogen enrichment disclosed by Glenn results in a different product and provides a different composition of the final product as well.

1.4 I also refer to Mr. Brooks Declaration at paragraphs 9-14 and his expert opinions that Glenn teaches away from Applicant's claims with respect to at least the Oxygen content.

2. Lambersten

Recognizing that the Glenn reference does not teach or suggest the subject matter defined by Applicant's claims, the Examiner also relies on the Lambersten reference to make his rejection. Lambersten teaches in his Summary of Invention how to substitute dangerous chemicals previously

used for fire suppression with nitrogen ***and*** carbon dioxide, and particularly teaches how much CO2 should be added to sustain mammalian life: "The process of the present invention comprises introducing in the confined space an effective amount of extinguishing gas comprising carbon dioxide and another inert gas..." Lambersten Col. 2, line 42. and Col. 4, line 22. Also, in Col. 4, lines 57-65, Lambersten explains that this is designed for fire extinguishment and not for preventing fires by hypoxic air ventilation as Applicant specifically calls for in claims 19, 20, 28, 31 and 40, among others. To the contrary, Lambersten et al teaches in his claim 1 "... introducing in the event of a fire into confined space an effective amount of an extinguishing gas comprising carbon dioxide and an inert gas which is not toxic itself nor ..." Applicant respectfully submits that, for at least the following reasons, Lambersten does not, taken alone or in consideration with Glenn, teach or suggest the claims under rejection. Mr. Brooks agrees as he explains in his Declaration at Paragraphs 15-19.

ARGUMENTS

2.1 First, Lambersten et al teaches a method and a process how to extinguish a fire by releasing an inert gas mixture. This kind of technology is known for over 50 years and employs bottled gas mixtures to extinguish fires. This has nothing to do with preventing fires using continuous ventilation with hypoxic air made by passing an air flow through air separation device. Bottled inert gas mixtures contain no oxygen and in each case it has to be calculated how much gas needs to be released in order to create a fire extinguishing atmosphere and not to kill human life. These systems are fundamentally different.

2.2 Second, Lambersten et al does not teach a person of ordinary skill in the art any technical way to extinguish fire. Rather, Lambersten describes research on mice in hypoxic atmosphere. The Table provided in Lambersten at Col. 5 applies to the reduction of oxygen content by dilution with hydrocarbons or other fire extinguishing agents. Again, this technology is not what Applicant calls for in the claims under rejections, and moreover provides a different effect, different initial and final products (see the Comparison Table attached).

2.3 Third, additionally, there is no evidence where the table provided in Lambersten at Col. 5 comes from. Some data in this table is absolutely wrong, as would be understood by a

person of ordinary skill in the art. For instance, the Table line 1 shows that cellulose acetate cannot burn at 16.8% of oxygen. However, this is misleading, since cellulose acetate has own chemically bound oxygen and can burn in almost inert atmosphere. Other data from the table can be questioned as well.

2.4 Fourth, there is a fundamental difference between fire suppression and ignition prevention. For instance, a material that can sustain burning at 12% of oxygen cannot be ignited at 15% of oxygen. However, we respectfully submit that this discovery is the basis of the Phenomenon of Hypoxic Ignition Prevention that Applicant is the first to have discovered and claimed. Therefore, flammability numbers provided by fire suppression do not apply to an environment continuously ventilated with hypoxic or oxygen-reduced air for fire prevention, as called for in many of the claims under rejection.

2.5 Fifth, the Lambersten fire suppression technology is conventional in that it requires to keep an agent under pressure in bottles or containers so it can be released in case of a fire. After that containers need to be send for refilling. Hypoxic air venting in accordance with Applicant's invention, operates in a fundamentally different way, and provides a superior result, in a clear technological and cost-effective advantage to all conventional fire suppression methods.

2.6 In addition to the foregoing, Applicant respectfully submits that the Examiner is incorrect in attempting to combine Lambersten's teaching of an oxygen content of 8 to 15% and carbon dioxide content of 2 to 5% to Glenn's teaching of an oxygen content of 9% or less. This can only be done by a hindsight reconstruction of the prior art, knowing what Applicant has disclosed and claimed, and is improper.

2.7 Further, Applicant draws Examiner's attention to the fact that oxygen reduction can be achieved using different methods, either by diluting an enclosed atmosphere with chemicals or other gases used in modern fire protection industry (CO2, Nitrogen, Argon, Fluorocarbons, etc.) or it can be achieved by simply ventilating with oxygen reduced (purified) air. As an example of a confusing approach to the oxygen percentage in enclosed spaces, I would like to provide an extraction from the preamble to the OSHA's Respiratory Standard:

> "OSHA believes that using an oxygen concentration of 19.5 percent as a baseline oxygen level is appropriate because exposure to such an atmosphere does not pose a serious health risk at elevations below 8,000 feet, i.e., the oxygen partial pressure in such atmospheres will remain above 100 mm Hg (Ex.164). Although OSHA realizes that the partial pressure of oxygen may be at or above 100 mm Hg even at some lower altitudes and lower oxygen concentrations, these lower-altitude, lower-concentration situations are generally unstable and can quickly deteriorate to life-threatening atmospheres."

19.5% of oxygen provides 148.51 mm Hg of partial oxygen pressure that corresponds to an altitude of 1900 feet. It would be ridiculous to claim that people can't work at higher altitudes! The only reason why OSHA sets this limit is because of a danger that the oxygen content might be reduced by the dilution of an internal atmosphere with harmful gases. On the other hand OSHA admits that environments above 100 mm Hg, which corresponds to 13.2% of oxygen are safe for humans, but they allow to go below 19.5% because of the risk of the harmful dilution. This particularly applies to brewing and other industries where oxygen can be displaced by carbon dioxide that is harmful to human life and can be deadly in concentration above 30%.

Applicant believes that this example would help to differentiate hypoxic venting from a dilution.

In summary, Applicant respectfully submits that neither Glenn nor Lambersten, taken alone or in combination, teach or suggest what Applicant has discovered, namely the use of air separation to obtain oxygen deplete gas mixture that has an oxygen content of between 10 and 16%, 10 and 12%, 12-16%, and other ranges, to prevent fire in a ventilated compartment of an aircraft. Glenn teaches away, and Lambersten teaches a different approach that cannot be combined with Glenn because of fundamental differences in technology.

Mr. Brooks' Declaration provides independent technical expert opinion of how a person of ordinary skill in the art would understand the Glenn and Lambertsten references, and supports Applicant's position. Mr. Brooks also points out how the Applicant's discovery and disclosures of a Hypoxic air of 10 or 12% to 15% oxygen ventilating a fuel tank compartment of an airplane was contrary to the longstanding practice in the industry, yet eventually recognized by and is now being adopted by the industry. Brooks Declaration at Paragraph 14. This, Applicant submits, is strong additional evidence of non-obviousness.

CONCLUSION

The arguments provided above show that both, Glenn and Lambersten do not teach or suggest

Applicant's invention defined by the claims under rejection, because the prior art is to:

- a different technology
- different methods of fire extinguishing
- different system (in case of Glenn, since Lambersten's system is for testing mice)
- different product used for fire extinguishing
- different composition of a final product created in an enclosed compartment

Applicant believes he provided sufficient argumentation in favor of his invention. Applicant respectfully requests to withdraw the rejection of the pending claims. Should any questions arise, the Patent Office is invited to telephone the applicant at (212) 826-0252.

Respectfully submitted,

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Dated: __13 March 2008__

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Lower cost, higher risk helped alter FAA stance
[FINAL Edition]
USA TODAY - McLean, Va.

Author: Alan Levin
Date: Feb 17, 2004
Start Page: A.03
Section: NEWS
Text Word Count: 684

Document Text

See also related article on 1A.

WASHINGTON -- In 2001, an aviation industry group concluded that flushing oxygen from jet fuel tanks to prevent explosions was prohibitively expensive and mechanically impractical.

As early as today, the Federal Aviation Administration was to announce that it plans to require a device to do just that on all jets vulnerable to explosions in their center fuel tanks.

What changed in such a short period?

An FAA scientist proved the device could be made relatively inexpensively and with virtually no moving parts, and the FAA realized that the risk of fuel-tank explosions was higher than had been believed.

The FAA's move appears to meet one of the key recommendations that was issued by the National Transportation Safety Board after the crash in 1996 of TWA Flight 800, a Boeing 747 that blew up shortly after takeoff from New York City. All 230 people aboard died.

The safety board, which investigates jetliner accidents, concluded that a measure such as injecting non-flammable nitrogen gas into fuel tanks was needed to ensure the tanks could not explode. The NTSB investigates accidents but has no power to regulate.

"I think it will be a major, major improvement," said Bernard Loeb, a retired NTSB official who oversaw the TWA investigation.

Officials say much of the credit for the new requirement goes to FAA scientist Ivor Thomas. Thomas, a Scottish immigrant, has spent years studying fuel tanks with Boeing and more recently the government. He oversaw research at the FAA's William J. Hughes Technical Center near Atlantic City into devices that extract nitrogen from the air and pump it into fuel tanks. The non- flammable nitrogen pushes out the air through vents. The oxygen in air is needed to cause an explosion.

In a key finding late in 2002, Thomas demonstrated that less nitrogen was needed than previously thought to prevent an explosion.

Air is one-fifth oxygen, and oxygen can cause substances such as jet fuel to burn or explode. Some military jets contain equipment that pumps nitrogen into fuel tanks to reduce the oxygen level to 10% or less.

The FAA tests showed that a fuel tank would not explode if oxygen levels were at 12%. That small difference allowed engineers to design much smaller nitrogen gas systems, substantially lowering the cost and weight of the devices.

Boeing, which had argued the devices weren't necessary, jumped on the bandwagon. It designed and tested its own nitrogen system and intends to offer it for sale soon, officials said.

Reviews of fuel-tank safety ordered by the FAA also continued to find ways that tanks could explode. Although fuel-tank explosions are rare (four such explosions have occurred since 1989), the danger appeared greater than initially believed.

Atmosphere Composition Comparison

Nitrogen Enriched Air (NEA) vs. Hypoxic Air

The table below represents the final air compositions of an enclosed atmosphere regulated to an O_2 concentration of 15% via **nitrogen dilution and hypoxic ventilation**, using 3 different methods:

- **Nitrogen Enrichment** – injecting nitrogen into an enclosed compartment for controlled dilution of the standard atmosphere inside until 15% O_2 is achieved
- **Ventilation via Membrane Air Separation** – continuous ventilation of an enclosed compartment with 15% O_2 hypoxic air produced using membrane separation technology
- **Ventilation via Pressure Swing Absorption** - continuous ventilation of an enclosed compartment with 15% O_2 hypoxic air produced using Pressure-Swing Adsorption technology

Gas	Normal Atmosphere	N_2 Dilution	Hypoxic Ventilation	
		Nitrogen Enriched Air	Membrane Separation	PSA Separation
O_2	20.84%	15.00%	15.00%	15.00%
CO_2	0.03%	0.02%	0.00%	0.04%
N_2	77.68%	83.74%	85.00%	84.10%
Ar	0.93%	0.67%	0.00%	0.00%
H_2O*	0.52%	0.56%	0.00%	0.80%

* H_2O composition based on 30% humidity at 21 degrees Celsius